Petroleum

2002 Facts at a Glance

Classification: Nonrenewable Energy Source

Percent of energy produced in US:	**18.3% (13.0 Q)**
Percent of energy consumed in US:	**37.2% (36.2 Q)**

Major uses: transportation, manufacturing

What Is Petroleum?

Petroleum is a **fossil fuel**. It is called a fossil fuel because it was formed from the remains of tiny sea plants and animals that died millions of years ago. When the plants and animals died, they sank to the bottom of the oceans. They were buried by thousands of feet of sand and silt.

Over time, this organic mixture was subjected to enormous pressure and heat as the layers increased. The mixture changed chemically, breaking down into compounds made of hydrogen and carbon atoms—hydrocarbons. Finally, an oil-saturated rock—much like a wet household sponge—was formed.

All organic material does not turn into oil. Certain geological conditions must exist within the oil-rich rocks. First, there must be a trap of non-porous rock that prevents the oil from seeping out, and a seal (such as salt or clay) that keeps the oil from rising to the surface. Even under these conditions, only about two percent of the organic material is transformed into oil.

A typical petroleum reservoir is mostly sandstone or limestone in which oil is trapped. The oil in it may be as thin as gasoline or as thick as tar. It may be almost clear or black.

Petroleum is called a **nonrenewable** energy source because it takes millions of years to form. We cannot make more petroleum in a short time.

History of Oil

People have used naturally available petroleum since ancient times, though they didn't know how to find it. The ancient Chinese and Egyptians burned oil for lighting.

Before the 1850s, Americans often used whale oil for light. When whale oil became scarce, people began looking for other oil sources. In some places, oil seeped naturally to the surface of ponds and streams. People skimmed this oil and made it into kerosene. Kerosene was commonly used to light America's homes before the arrival of the electric light bulb.

As demand for kerosene grew, a group of businessmen hired Edwin Drake to drill for oil in Titusville, Pennsylvania. After much hard work and slow progress, he discovered oil in 1859. Drake's well was 69.5 feet deep, very shallow compared to today's wells.

Drake refined the oil from his well into kerosene for lighting. Gasoline and other products made during refining were simply thrown away because people had no use for them.

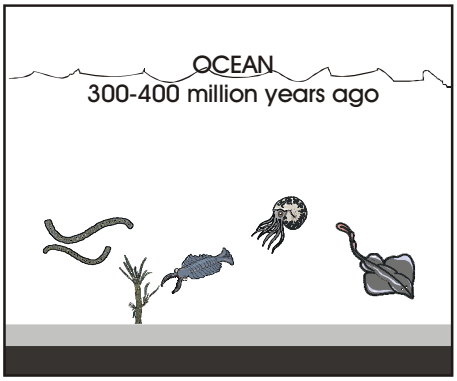
In 1892, the horseless carriage, or automobile, solved this problem, since it required gasoline. By 1920, there were nine million motor vehicles in this country and gas stations were opening everywhere.

Producing Oil

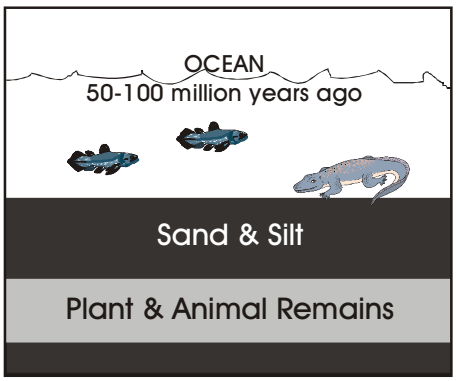
Although research has improved the odds since Edwin Drake's days, petroleum exploration today is still a risky business. Geologists study underground rock formations to find areas that might yield oil. Even with advanced methods, only about 44 of every 100 exploratory wells find oil. The rest come up dry.

When oil is found, a petroleum company brings in a 50 to 100-foot drilling rig and raises a derrick that houses the tools and pipes that go into the well.

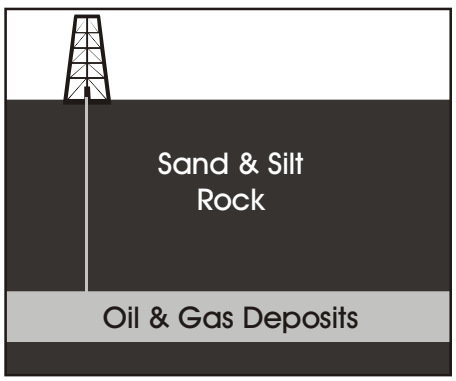
PETROLEUM & NATURAL GAS FORMATION



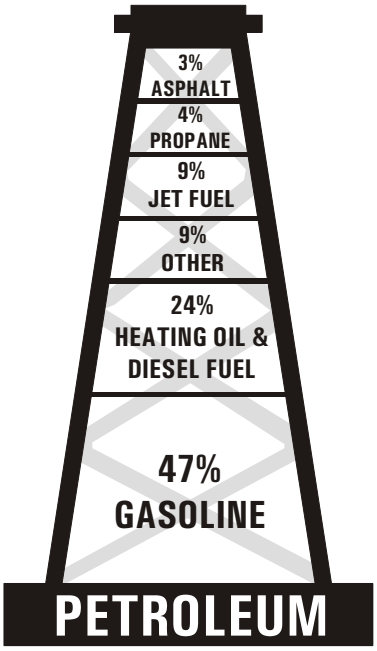
Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sand and silt.



Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.



Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.



Today's oil wells average 6,000 feet deep and may sink below 20,000 feet. The average well produces about 11 barrels of oil a day.

To safeguard the environment, oil drilling and oil production are regulated by state and federal governments. Oil companies must get permission to explore for oil on new lands. Many experts believe that 85 percent of our remaining oil reserves are on land owned by the federal government. Oil companies lease the land from the federal government, which, in return, receives rental payments for the land as well as percentage payments from each barrel of oil.

Top Producers

Texas produces more oil than any other state. The other top producing states are Alaska, California, Louisiana, and Oklahoma. In all, 31 states produce petroleum.

From Well to Market

We cannot use crude oil in the state it's in when it comes out of the ground. The process is a little more complicated than that. So, how does thick, black crude oil come out of the ground and eventually get into your car as a thin, amber-colored liquid called gasoline?

Oil Refineries

Oil's first stop after being pumped from a well is an oil refinery. A **refinery** is a plant where crude oil is processed. Sometimes, refineries are located near oil wells, but usually the crude oil has to be delivered to the refinery by ship, barge, pipeline, or train.

After the crude oil has reached the refinery, huge round tanks store the oil until it is ready to be processed. Tank farms are sites with many storage tanks.

An oil refinery cleans and separates the crude oil into various fuels and by-products. The most important one is gasoline. Some other petroleum products are diesel fuel, heating oil, and jet fuel.

Refineries use many different methods to make these products. One method is a heating process called **distillation**. Since oil products have different boiling points, the end products can be distilled or separated. Asphalts have a higher boiling point than gasolines, allowing the two to be separated.

Refineries have another job. They remove contaminants from the oil. A refinery removes sulfur from gasoline, for example, to increase its efficiency and to reduce air pollution. Nine percent of the energy in the crude oil is used to operate the refineries.

Shipping Oil Products

After processing at the refinery, gasoline and other petroleum products are usually shipped across the country through pipelines. There are about 230,000 miles of pipelines in the United States. Pipelines are the safest and cheapest way to move large quantities of petroleum across land.

Pump stations, which are spaced 20 to 100 miles apart along the underground pipelines, keep the petroleum products moving at a speed of about five miles per hour. At this rate, it takes 15 days to move a shipment of gasoline from Houston, Texas to New York City.

Distribution

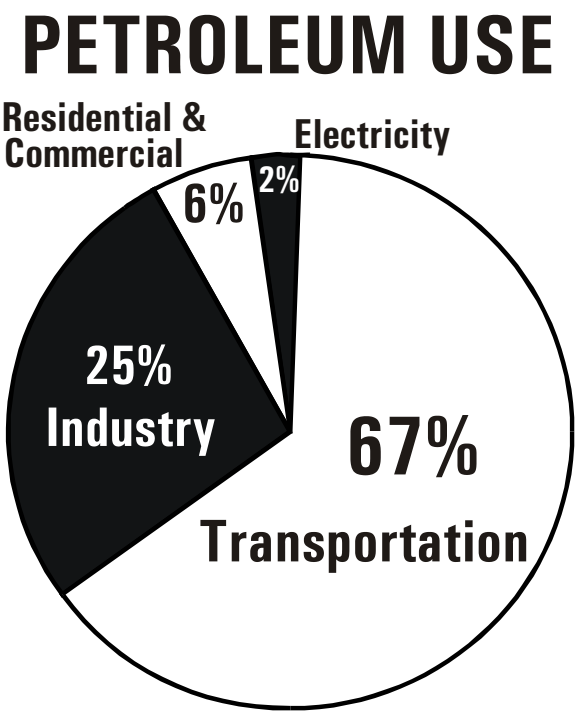
Companies called **jobbers** handle the wholesale distribution of oil. There are 15,000 jobbers in the U.S., and they sell just about everything that comes out of a barrel of crude oil. Jobbers fill bulk orders for petroleum products from gasoline stations, industries, utility companies, farmers, and other consumers.

The retailer is the next link in the chain. A retailer may be a gasoline station or a home heating oil company. The last link is when you pump gasoline into your car, and the engine converts the gasoline's chemical energy into mechanical energy to make your car move!

Demand for Oil

Since World War II, petroleum has replaced coal as the United States' leading source of energy. Petroleum supplies 37.2 percent of the energy used in the United States. (Coal supplies 22.8 percent and natural gas supplies 23.7 percent of our energy needs.)

Americans use about 18 million barrels of oil (more than 750 million gallons) every day of the year. And experts say we will be using more oil, especially for transportation, in the coming years.



Even now, we use about 30 percent more oil for transportation than we did in 1973, when the first oil crisis hit the United States. This is true even though today's automobiles almost twice as many miles to the gallon as their 1970s counterparts. There are two-thirds more vehicles on the road today than in 1973. Today, we use about two out of every three barrels of oil to keep us on the move.

TOP OIL PRODUCING COUNTRIES 2002

Imported Oil

To satisfy our appetite for petroleum, the United States has become increasingly dependent upon other countries for petroleum. Today, we purchase almost two-thirds of our petroleum from other countries.

Americans know this dependence can be dangerous. We were first alerted to the danger in 1973 when some Arab countries stopped shipping oil (called an embargo) to the United States. These countries belonged to an international trade group called the Organization of Petroleum Exporting Countries or OPEC for short.

OPEC members try to set production levels for petroleum. As a rule, the less oil they produce, the higher the price of oil on the world market. The OPEC countries don't always agree. Some OPEC countries want to produce less oil to raise prices. Other OPEC countries want to flood the market with petroleum to reap immediate returns.

The next shock came in 1978-79 when the Iranian Revolution cut off oil production. Again, world oil prices raced up. Our most recent crisis was the Persian Gulf War. Iraq invaded Kuwait, and again, Americans worried about oil shortages and skyrocketing oil prices. The U.S. has taken some steps to prevent another big oil crisis. For one thing, the U.S. has about a three-month supply of oil tucked away in the **Strategic Petroleum Reserve (SPR)**. Established in 1975, the SPR is only to be tapped during an energy emergency. The SPR was first used in January 1991, during the Persian Gulf Crisis.

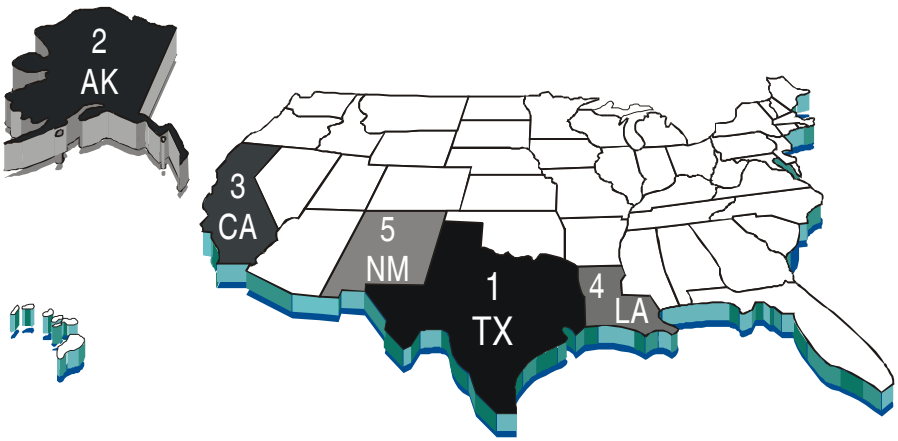
The United States has also turned to non-Arab and non-OPEC countries for oil imports. Today, we import much of our oil from Canada and Mexico. This is good for us because we have friendly relations with our neighbors, and because the oil doesn't have to be shipped so far. Still, the amount of oil that we can import from Canada and Mexico is limited. By law, Mexico can only export half the oil it produces to the United States.

Even with the SPR and imports from friendly, non-OPEC countries, U.S. oil supply is not totally secure. We buy almost half of our imported oil from OPEC countries, a fourth from Arab countries.

Some economists believe the United States is setting itself up for another oil crisis. Other analysts say a true oil shock—like those of the 1970s—is unlikely because the producing nations don't want to drive their customers away or encourage a shift to other forms of energy.

Still, there are more steps we can take to help ensure our energy security. Depending on whom you talk to—whether an oil company representative or an environmentalist—opinions vary on the one or more steps we should take. Some experts believe we should decrease our demand for oil through increased conservation. Others say we should increase oil production and exploration in the United States, particularly in the Arctic National Wildlife Refuge (ANWR) in northern Alaska. Others say we should use alternative fuels, especially for transportation. Some experts believe we will need to do all three to avert another oil crisis.

TOP PETROLEUM PRODUCING STATES



Offshore Oil Reserves

There are rich deposits of petroleum and natural gas on the outer continental shelf (OCS), especially off the Pacific coasts of California and Alaska and in the Gulf of Mexico. Thirty basins have been identified that could contain enormous oil and gas reserves. It is estimated that 30 percent of undiscovered U.S. gas and oil reserves are contained in the OCS.

Today, there are more than 4,000 drilling platforms, servicing thousands of wells. OCS production supplies approximately 30 percent of the nation's natural gas production and 24 percent of its oil production. Most of the active wells are in the Central and Western Gulf of Mexico, with additional wells off the coast of California.

Although there are no producing wells in other areas, there is believed to be significant oil potential in the Beaufort Sea off Alaska, as well as natural gas potential in the Eastern Gulf of Mexico and in certain basins off the Atlantic Coast.

On December 31, 1997, President Clinton excluded the Pacific OCS, the North Atlantic and North Aleutian areas, and parts of the Eastern Gulf of Mexico from energy development until the year 2007.

Offshore production is costly—many times as expensive as land-based production. To reach oil buried in shallow water, drilling platforms stand on stilt-like legs that are imbedded in the ocean floor. These huge platforms hold all the drilling equipment needed, as well as housing and storage areas for the work crews. Once the well has been drilled, the platforms also hold the production equipment.

Floating platforms are used for drilling in deeper waters. These self-propelled vessels are anchored to the ocean bottom with huge cables. Once the wells have been drilled from these platforms, the production equipment is lowered to the ocean floor and sealed to the well casings to prevent leakage. Wells have been drilled in 10,000 feet of water using these floating rigs.

Oil Prices

Most of the world moves on petroleum—gasoline for cars; jet fuel for planes; diesel fuel for trucks. Then there is petroleum for running factories or manufacturing goods. That's why the price of oil is so important. In 1998, the price of a barrel of oil averaged dropped as low as $8 a barrel, then in 2002 the price shot up to over $42, the highest price in history.

Low oil prices are good for the consumer and the economy, acting as a check on inflation. The oil industry, however, does not prosper during periods of low oil prices. Oil industry workers lose their jobs, many small wells are permanently sealed, and the exploration for new oil sources drops off.

Low oil prices have another side effect. People use more petroleum products when crude oil is cheap. We buy bigger cars and drive more miles.

Oil & the Environment

In the United States, we use more petroleum than any other energy source. Petroleum products—gasoline, fertilizers, plastics, medicines—have brought untold benefits to Americans and the rest of the world. We depend on these products, and, as consumers, we demand them. But there is a flipside—petroleum production, distribution and consumption can contribute to air and water pollution.

Drilling for oil can disturb fragile ecosystems. Transporting oil can endanger wildlife and the environment if it spills into rivers or oceans. Leaking underground storage tanks can pollute groundwater and create noxious fumes. Processing oil at the refinery can contribute to air and water pollution. Burning gasoline to fuel our cars contributes to air pollution. Even the careless disposal of waste oil drained from the family car can pollute rivers and lakes.

Many advances have been made in protecting the environment since the passage of the Clean Air Act in 1970. Oil companies have redesigned their refineries to reduce emissions into the air and water. Gasolines have been reformulated to burn cleaner, dramatically cutting the levels of lead, nitrogen oxide, carbon monoxide, and hydrocarbons released into the air.

The production, transportation, distribution, and consumption of petroleum are strictly regulated to minimize the negative effects on the environment.

Our increasing dependence on petroleum presents a continuing challenge. The future must balance the growing demand for petroleum products with protection of the global environment.

TOP SOURCES OF U.S. IMPORTED OIL 2002

SOURCE: ENERGY INFORMATION ADMINISTRATION